HIGH RESOLUTION OBSERVATIONS OF THE DIFFUSE LYMAN ALPHA SKY BACKGROUND

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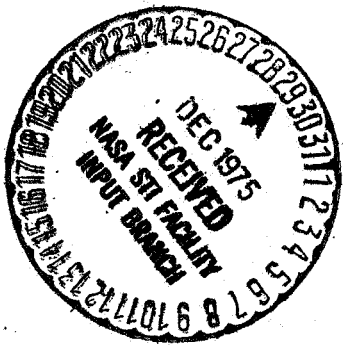

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SUMMARY

During this period the reduction and analysis of the Lyman alpha sky background data taken by the Princeton Experimental Package on the Copernicus satellite (OAO-3) was accomplished. The background emission is clearly detected appreciably Doppler shifted from the geocoronal emission. This data, assuming its reliability is confirmed by calibration observations now in progress, will provide important constraints on the conditions in the interstellar medium near the Solar System.

The data to be analyzed in this project were taken during a six day period in 1975 April by the Princeton Experimental Package on the Copernicus satellite (OAO-3). This data consisted of repeated high resolution scans of the spectral region extending from just longward of the geocoronal Lyman alpha emission line approximately 0.6 Å to shorter wavelengths. The data were taken with the telescope pointed toward a fixed position near the star Mu Ophiuchus, expected to give a strong signal. The purpose of the project was to detect and measure the velocity of the diffuse Lyman alpha sky background feature, expected to lie 0.1-0.2 Å shortward of the geocoronal line. This diffuse background feature is solar Lyman alpha scattered back to us by the neutral hydrogen atoms in the interstellar gas that penetrate into the Solar System.

A preliminary reduction of the data was carried out during a visit to Princeton University by the Principal Investigator and the Senior Programmer hired under this Grant, Mrs. Priscilla C. Frisch. The data were then taken on magnetic tape back to Chicago where the reduction and analysis were continued. In the reduction and analysis process, the data were sorted according to the particle background level and also according to the solar zenith angle at the time of observation. Sorting by the particle background allowed the noisiest scans to be omitted when the scans were combined. Sorting by the solar zenith angle made it possible to look selectively at portions of the data in which the geocoronal emission was extremely weak, moderate, or very strong.

During the analysis, composite scans including the entire body of data, and also including subsets of the data selected as above and in other ways were produced. Each of these composite scans shows a feature that can be identified with the diffuse Lyman alpha background. The feature is well enough defined to permit an accurate measure of its Doppler shift and intensity. In fact, its Doppler shift is somewhat larger than expected so that it is not strongly affected by the geocorona. However, its weakness precludes a measurement of its profile, although it will be possible to place an upper limit on its extent in wavelength.

These results have not been published yet, pending the arrival of new calibration data. This new data will consist of comparable scans taken with the telescope pointing down at the sunlit Earth. This data will a fortiori not contain any background feature and will thus be a sensitive check on possible grating ghosts or scattered light in the instrument that might produce a faint spurious feature. That data should be available early in 1976 and, assuming it does not show any spurious features, will allow the data mentioned above to be published with confidence. The Doppler shift, intensity, and information about the extent in wavelength of the background feature, when combined with previous observations, will provide important constraints on the conditions in the interstellar medium near the Solar System.